a prominent part until failing health compelled him to retire. In the conduct of the business, as well as in the discussion of professional subjects, his ripe experience, sound judgment, and charming personal qualities had much to do with the successful development of the institution, the membership of which includes not merely naval architects and marine engineers, but naval officers, shipowners, yachtsmen, officers of the mercantile marine, and many other classes interested in or connected with shipping.

At the Royal United Service Institution also Sir John Hay did good service, and gave proof of his love for and acquaintance with many branches of science, as well as his desire to utilise all departments of knowledge for the improvement of the Royal Navy. In short, for a man born early in the nineteenth century, and employed at sea from a tender age until he had reached the prime of life, Sir John Hay was remarkable; and he may be fairly described as a pioneer in the class of scientific naval officers which has now become both numerous and influential.

Of his political career this is not the place to speak, but allusion may be made to his services as a Sea Lord of the Admiralty in 1866–8. Although the appointment of Sea Lords was then made largely on political as well as professional grounds, and his political future might have been seriously prejudiced by the independent action which he took in November, 1866, he refused to sign the Navy Estimates, and tendered his resignation because he considered the new programme of shipbuilding to be inadequate. This action showed the temper of the man, who, under a most pleasant and conciliatory manner, concealed great strength of character and readiness to act up to his convictions. His business capacity was considerable, he was a capable speaker, and an agreeable writer, as his books dealing with the naval service showed. He died full of years and honours, mourned by many friends; but some years of retirement, accompanied by blindness towards the end, had prevented him from being so much before the public as formerly. His work was done and well done, and many of its results will abide.

DR. A. H. KEANE.

WE regret to announce the death of Dr. A. H. Keane on February 3, after a long illness. He was born in Cork in 1835, was educated in Dublin and elsewhere, and completed his student career in Rome, finally taking his degree with honours in the Roman Catholic College in Dublin. Later he studied in Germany, and thereafter devoted himself to literary work, his first important book being a "History of the English Language" (1878). Shortly afterwards he taught English, German, French, and Hindustani at the Hartley Institute, Southampton, and subsequently a professorship of Hindustani was created for him at University College, London, which he resigned in 1885. After a short visit to the United States, he settled down in Hampstead, where he resided until his death.

Anthropology loses in Dr. Keane one of its most prolific and erudite students. His literary training and great command of languages predisposed him to collation and synthesis, as is proved by several excellent studies in the Journal of the Anthropological Institute; for example, "On the Relations of the Indo-Chinese and Inter-Oceanic Races and Languages" (1880), "The Botocudos" (1883), "The Ethnology of the Egyptian Sudán" (1884), "The Lapps" (1885), and others. He also contributed very numerous articles on ethnology to NATURE, *The Geographical Journal*, *The Academy*, *The Encyclopaedia Britannica* (ninth edition), *Chambers's Encyclopaedia* (1890–1), and *Cassell's Storehouse of General Information* (1890–94). Of more permanent value are his admirable monographs on Asia, Africa, Central America and West Indies, and South America in "Stanford's Compendium of Geography and Travel." Amongst other publications are "The Boer States, Land, and People" (1900), "The Gold of Ophir" (1901), and numerous translations, as, for example, "The Earth and its Inhabitants" (Elisée Reclus), "Peruvian Antiquities" (W. Reiss and A. Stübel), "The Science of Language" (Abel Hovelacque), "Philosophy, Historical and Critical" (A. Lefèvre), "Travels in Africa" (W. Junker), and "The Second Deluge" (J. Rodenberg).

But Dr. Keane's reputation will rest mainly on his "Ethnology" (1896), "Man Past and Present" (1899), and "The World's Peoples" (1908). The first deals with the physical and mental evolution of man, the antiquity of man, criteria of race, and the primary ethnical groups. The second is a masterly summary of the ethnology of all races and peoples, and is an indispensable book to all interested in such subjects. The third, as its subtitle explains, is a popular account of the bodily and mental characters, beliefs, traditions, and political and social institutions of the world's peoples; the numerous photographs add greatly to its value.

Dr. Keane was a typical library student, and being of retiring disposition, was rarely to be seen at scientific meetings. He had strong views and could express them with vigour, but he did not seek controversy. Although lack of opportunity prevented him from making any original investigations, the vast extent of his reading enabled him to marshal in an orderly manner the observations of other people, and often to throw a fresh light upon them.

A. C. HADDON.

NOTES.

WE regret to announce the death, on February 2, in his sixtieth year, of Dr. H. T. Bovey, F.R.S., formerly Rector of the Imperial College of Science and Technology.

M. BIGOURDAN has been elected president of the Paris Bureau des Longitudes for the present year. M. Baillaud becomes vice-president, and M. Andoyer secretary.

THE gold medal of the Royal Astronomical Society has been awarded by the council to Mr. A. R. Hinks, for his determination of the solar parallax from observations of Eros.

THE Canadian correspondent of *The Times* announces the death, at eighty-seven years of age, of Sir James Le Moine, who for many years was an industrious writer on historical and ornithological subjects, and in 1894 was elected president of the Royal Society of Canada.

REUTER'S AGENCY reports that two British officers, one belonging to the Survey of India, have been detached to locate the falls of the Brahmaputra, which are reputed to exist in the hitherto unexplored reach of the river which lies between Assam and the great bend of the river to the northward. Attempts have been made by native surveyors and others to locate these falls and to traverse this part of the river where its valley cuts across the great Himalayan chain, but so far without any success.

FURTHER evidence shows that, of the four reported earthquakes referred to in our last issue (p. 459), that felt in Glenfruin on January 26 was probably not of seismic origin. The shocks at Lennoxtown on January 20 and

Llanhilleth on January 26 were extremely local, and there can be little doubt that they were due in part to artificial causes. The Dunblane shock of January 28 was one of the series of earthquakes which have been so prevalent since 1905 on the south side of the Ochil Hills, possibly with its focus rather farther to the west than usual.

A CELEBRATION of the centenary of the Academy of Natural Sciences of Philadelphia is to be held on March 19–21. The publication of three volumes has been decided upon: a commemorative volume of scientific memoirs; an index to the series of Proceedings and Journal up to and including 1910, now amounting to nearly one hundred volumes; and a detailed history of the academy by Dr. Nolan. Delegates will be received and historical addresses will probably be delivered on the first day; two morning sessions will be devoted to the reading of scientific papers; and there will be a banquet on the evening of March 21, the official birthday of the academy.

WE learn from a communication received from the Decimal Association that the King of Siam, on November 15 last, ordered the adoption of the metric system throughout his kingdom at an early date. The authorities in Siam are in communication with the Bureau International des Poids et Mésures at Sèvres on the subject of the provision of standards and prototypes for furnishing a Central Office of Weights and Measures for the country. The Government stands pledged to the passing of a law introducing the system in about a year from now, which law, after an optional period of one year only, will be enforced throughout the kingdom.

PROF. A. S. HITCHCOCK, systematic agrostologist of the Bureau of Plant Industry, U.S. Department of Agriculture, who represented the Smithsonian Institution in the biological survey of the Canal Zone as a collector of grasses, has just returned to Washington. He estimates that he has secured about 150 species of grasses from the Canal Zone alone, and that, including the collections of Messrs. Pittier and Maxon, the National Herbarium will have as many as 200 species from Panama. This greatly increases the known species, and Prof. Hitchcock believes that he has from four to five times as many from this region as were previously known. Many of the species found in Panama were known previously only from Brazil and other regions of South America.

DR. L. A. BAUER returned to his office at Washington, D.C., at the end of December last, after a nine months' trip of inspection of magnetic work on board the *Carnegie*, and visiting magnetic institutions in the Pacific Islands, New Zealand, Australia, India, Burma, China, and Japan. Three positions as magnetic observer are to be filled in the Carnegie Institution of Washington at salaries ranging from 900 to 1500 dollars per annum and field expenses, according to training and experience, with possibility for further promotions as advancement is made. The duties imply assignment to magnetic survey work (determination of the magnetic elements), according to circumstances, either on land in foreign countries or at sea on board the magnetic survey yacht *Carnegie*. Applications, with full statements as to collegiate training and experience, and accompanied by references, should be forwarded immediately, and addressed to: The Director, Department of Terrestrial Magnetism, The Ontario, Washington, D.C.

IN the notice of Prof. Sollas's "Ancient Hunters" in NATURE of January 25, the reviewer assumed that as no reference was made to Mr. J. Reid Moir or his sub-Crag flints they were "rejected as convincing evidence of man's existence." Mr. Moir writes to suggest that the absence of mention of his implements from below the Crag is probably due to the chapter dealing with "Eoliths" having been written before the facts of his discovery were made public. We understand that the book was in print before Prof. Sollas had the opportunity of examining Mr. Moir's specimens, so that it is scarcely correct to assume that he has rejected them as evidence of man's workmanship.

THE discovery of a human skeleton beneath a stratum of Boulder Clay near Ipswich, and partly embedded in the underlying mid-Glacial sands, is likely to prove an event of considerable importance to those interested in the evolution of the modern type of Man. According to the somewhat sanguine report which appeared in *The Times* of February 1, Mr. J. Reid Moir and those who saw the remains *in situ* are confident that the overlying stratum of Boulder Clay (4½ feet in depth) was undisturbed, and that the remains are older than the deposition of the Chalky Boulder Clay, which marks the most severe of the various Glacial periods. If this proves to be the case, and no doubt Mr. Moir and those associated with him will place all the evidence before experts at an early date, the skeleton thus found will be the earliest remains of the human body yet found in England. The skeleton has been examined by Prof. Keith, who reports that in all its essential features it is of the modern type, with absolutely no trace of the unmistakable characters of Neanderthal man. Yet the period assigned to the Ipswich remains is long anterior to the Mousterian period to which the remains of Neanderthal man belong. To those who regard Neanderthal man as an altogether distinct form of mankind which persisted long after the modern type of man (*Homo sapiens*) was evolved, this discovery at Ipswich will cause no surprise.

THE study of plant diseases is so important from the technical point of view, and presents so many problems of scientific interest, that any suggestions for advancing it deserve serious consideration. The Biology Committee of the Agricultural Education Association is organising a card index that shall form a systematic record of fungus, insect, and other diseases of plants, and invites the cooperation of those able and willing to help in order that the record shall be as complete as possible. The value of the work, of course, will depend entirely on the extent to which this invitation is taken up. The record thus compiled will be available for consultation by any investigator, either by application to the secretary of the committee, Prof. J. H. Priestley, of the University of Leeds, or by application to the Board of Agriculture, which will hold duplicates of all the entries. The committee hopes to receive the cooperation of all investigators of this subject in the British Isles, and to form a record that shall not only be useful to the economic biologist, but also to the mycologist and to other students of plant diseases. Full information about the scheme can be obtained from Prof. Priestley.

IT is stated by *The Times* that the Daylight Saving Bill is to be brought forward again next Session, and its supporters hope that a member who obtains a good place in the ballot will introduce it. From the same source we learn that resolutions in favour of the Bill have now been passed by 408 city corporations and town and district councils, including the Cities of London, Westminster, Glasgow, Liverpool, Belfast, Dublin, Sheffield, and Bradford, and a majority of the London boroughs—that is to say, seventeen out of twenty-eight. It is scarcely to be expected that the representatives upon these bodies should be familiar with the zone system of standard time reckoning now recognised throughout almost the whole civilised world, for if they were they would understand the practical and international importance of the invariability of the Greenwich meridian upon which the system is based. Surely in a matter of this kind expert knowledge is a safer guide to follow than argument derived from the counting of heads. What is wanted is the opinion of astronomers, navigators, and others, who know the meaning of standards of time and longitude, rather than of city corporations and district councils, which would just as cheerfully pass a resolution in favour of a periodical change of position of the equator as they do that for placing Greenwich in the longitude of Berlin during certain months of the year.

MR. C. G. ABBOT, director of the Smithsonian Astrophysical Observatory, has just returned to Washington from Bassour, Algeria, where he has been making astrophysical observations in regard to the solar constant of radiation. The observing station in Bassour was established in July, 1911, when Mr. Abbot and his field assistant, Prof. F. P. Brackett, of Pomona College, arrived in Algeria, and observations were continued until the end of November. From previous work at Washington, Mount Wilson, and Mount Whitney, it had been determined that the sun was probably a variable star, and that apparently its radiations frequently fluctuated from 2 to 5 per cent. during irregular periods of from five to ten days' duration. Although strongly indicated by the work on Mount Wilson, the result was so important that it seemed necessary to test it further by means of simultaneous independent observations held at Mount Wilson and some other high altitude station remote from there, where an equally cloudless atmosphere existed. Mr. Abbot made complete determinations of the solar constant of radiation for forty-four days in Bassour, while his assistant, Mr. L. B. Aldrich, made similar measurements at Mount Wilson, Cal. The two observing stations were separated by a distance nearly equal to that of one-third the circumference of the earth, thus making the locations ideal in that respect. Unfortunately, some cloudy weather was encountered at each of the stations, but the records of about thirty days will be available for comparison.

THE *Evening News* of February 1 made some interesting remarks on Candlemas, February 2, one of the great festivals of the May or agricultural year which precedes the present solstitial year. The church candle festival followed the lighting of bonfires or blazes in the stone circles, and was dedicated to St. Blazius. The proverbs show that the day has always been considered a critical one from the meteorological point of view—indeed, "The proverbs which cluster round this day are more numerous than those about St. Swithin's, St. Martin's, and St. Michael's Days combined. And they all refer to the weather."

"If Candlemas Day is come and gone,
The snow lies on a hot stone (*i.e.* soon melts)."

"If Candlemas Day be fine and clear,
There'll be two winters in the year."

"A windy Christmas, a calm Candlemas,
Are sure signs of a good crop of grass."

"If Candlemas Day bring clouds and rain,
Winter is gone and won't come again."

"If the lark sings before Candlemas (it did in 1912)
She'll soon cry out and mourn alas!"

These proverbs are followed by a letter from a correspondent, who writes as follows:—"You may sum up this British proverbial wisdom thus: If February 2 (Candlemas Day) is cold, we shall have a cold, late spring and a fine summer. If wet and warm, the chances are we shall get a dismal summer after a fine, open spring. Some of the scores of available proverbs contradict each other on minor points. They all agree that February 2 (Candlemas Day) is a critical point in the year. It sets the barometer and thermometer for us. For years I have verified it, and my advice is, watch the weather on February 2."

THE December (1911) number of *The Journal of Hygiene* (vol. xi., No. 4) contains a paper by Drs. Stokvis and Swellengrebel on the purification of water by an infusorian (*Colpoda cucullus*). Numbers of Colpodæ were added to emulsions of bacteria in water, and as a result the water was clarified, and the bacteria were removed. The purification was effected only in the presence of living Colpodæ.

WE have received the first number of *The Journal of Vaccine Therapy*, which is edited by Dr. R. W. Allen and published by Mr. H. K. Lewis. It contains papers on the vaccine treatment of rheumatic fever and chorea by Dr. Buchanan, of typhoid fever by Dr. Sadler, and of acne by Dr. Allen. Important as vaccine treatment is, we scarcely think that the subject requires a special journal.

The Malaya Medical Journal for last October (vol. ix., part iv.) is devoted to the subject of beri-beri. Recent research, in particular by Braddon, Fraser, and Stanton, strongly suggests that the use of "polished" rice, which seems to be deficient in certain nutritive qualities, is the cause of this disease. The editor, however, points out that there are certain outbreaks which do not seem to be explicable on this hypothesis, and publishes a translation of a paper by Kohlbrugge in which it is suggested that certain acid-forming bacteria present on rice may be the actual cause of beri-beri.

AT the present time, when public interest is directed to the political situation of China, we may direct attention to two valuable papers contributed by Mr. E. W. Capen to the fifth volume of the Publications of the American Sociological Society. In the first this writer, who is familiar with the conditions of inner China, gives a graphic account of his observations. He describes, in order, the struggle for existence, the physical constitution of the people, their mental characteristics, the organisation of family life, the evils resulting from neglect of forest conservation, and the lack of patriotism among the rural population. It is, on the whole, a melancholy picture of social decay as the result of misgovernment. The most interesting portion is that in which he discusses the physical characters of the people and their power of resistance to disease and injuries as compared with Europeans. In the second paper he reviews with ample knowledge the effects of Western influences upon the people of the Orient.

AFTER an exhaustive study of the limb-arteries of the Primates, the details of which are recorded in the January number of *The Journal of Anatomy and Physiology*, Mr. T. Manners-Smith arrives at the conclusion that these arteries—as, indeed, had been previously suggested—are arranged on a definite system. They are, in fact, formed on a segmental plan, and to some extent appear to have constituted portions of the tubules of an arterial plexus with longitudinally arranged meshes. "We must also regard the normal arrangement, which is proper to a particular family or species, as the result of mechanical conditions affecting the particular family or species in such a way that the departure from the general reticular plan is fixed and definite for the animal in question."

THE American Bison Society, in its fourth annual report, 1910–11, has to deplore the loss of the services of its president, Dr. W. T. Hornaday, who has been compelled by pressure of other work to resign that position. He has been elected the first honorary member of the society, and is succeeded in the presidential chair by Prof. F. W. Hooper. Despite a few mishaps, matters appear to be going well with the survivors of the bison in its native country, the total number of pure-bred animals being 2760, against 2108 in 1910 and 1917 in 1908. Attempts to capture the remnant of the Pablo herd in the Flathead country for the Canadian Government have had to be abandoned on account of the wild state of the animals, which have become completely uncontrollable. The society is anxious to establish a new herd in one of the Dakotas, preferably South Dakota, which formed part of the headquarters of the bison, and the proposal has been favourably received by the secretary to the Federal Government. Efforts are also being made with a view to the establishment of a herd either in the Adirondack Range or in the new Hudson River Park, New York State.

THE horned lizards, or "horned toads," of California and Nevada form the subject of an illustrated monograph by Mr. H. C. Bryant in the Zoological Publications of the University of California (vol. ix., No. 1), which also includes a survey of the whole group. In the second edition of the British Museum "Catalogue of Lizards," twelve species, all included in the genus Phrynosoma, of these strange reptiles were recognised; but Mr. Bryant now admits sixteen, one of which, from the desert tracts of the Gila and Colorado valleys, is made the type of a separate genus, under the name *Anota maccalli*, its claim to this distinction being based on the length, smoothness, and conical forms of the horns, the presence of three (in place of one or two) rows of peripheral spines, the flattened tail, and the existence of supratemporal openings in the skull. Excellent figures show the specific variation of the skull, which in its horn-sheathed spines exhibits a remarkable parallelism to some of the dinosaurs. These horns are considered to be for defensive purposes, serving to frighten certain enemies, although it is scarcely conceivable that they can be efficacious in the case of rattlesnakes, which are some of the worst foes. Some of these lizards are viviparous, but others are oviparous, the eggs being in the case of one species buried in the sand, although in a second they are hatched almost immediately after extrusion. Particulars are given with regard to the remarkable habit possessed by these lizards of spurting jets of blood from the eye, from which it appears that the phenomenon is preceded by congestion of the upper eyelid, from the under-surface of which the jet issues.

LITTLE information has hitherto been accumulated about the composition of cow's milk in India. Messrs. Meggitt and Mann have recently published in the Memoirs of the Department of Agriculture in India a number of analyses which show that the milk contains a high percentage of butter-fat, as much as 5 or 6 per cent., against a general 3 per cent. in England, but there is very great variation even among animals of the same breed. Indeed, the whole investigation emphasises the extremely unselected character of the herds, and suggests possibilities of marked improvement if selection is carried on over a sufficient time.

IN the October (1911) number of *The South African Journal of Science*, the organ of the South African Association for the Advancement of Science, Dr. Juritz describes the results of the chemical investigations he has made in Cape Colony during the last twenty years or more. They deal with waters, poisonous plants, soils, fertilisers, cereals and other agricultural produce, and minerals, and afford an admirable illustration of the way in which the chemist can serve a new country. A short biography is given of the late Dr. Bolus, who played so prominent a part in the development of botany in Cape Colony.

OF the many problems connected with soil fertility, few are more important than those centring round soil erosion. The causes and remedies are dealt with at some length by Mr. M'Gee in Bulletin 71 of the United States Department of Agriculture, Bureau of Soils, where some admirable photographs also are given showing the various types of erosion. Whenever land is brought into cultivation and then neglected, erosion is likely to be serious; only when the surface is covered with vegetation can it resist the disintegrating effect of the rain. Very slight depressions in the surface suffice to form a channel, which rapidly widens and deepens, and before long attains considerable dimensions. The remedies consist, therefore, in planting the land and in terracing.

A USEFUL article dealing with two prevalent diseases of the potato plant is contributed by Mr. R. S. Horne to the Journal of the Royal Horticultural Society (vol. xxxvii., part ii.). The author sifts carefully the conflicting statements ranged round the lowly fungal organism *Chrysophlyctis endobiotica*, producing a disease known under the different names "tumour," "warty disease," and "black scab," and contrasts the swellings induced by it with the more pronounced canker caused by the myxomycete *Spongospora solani*; the latter disease is known as "corky scab," or "potato canker." The author adopts the terms tumour and canker because they indicate the actual nature of the diseases, which are, of course, quite distinct from the potato disease due to *Phytophthora infestans*. Attention is also directed to a note by Mr. F. J. Chittenden in the Journal discussing self-sterility of apple trees, that is, the dependence of fruit formation upon pollination of the flowers with pollen from another variety.

IN the January number of *Petermann's Mitteilungen* Prof. A. Woeikow discusses the salinity of the oceans, and in particular the greater salinity of the Atlantic Ocean as compared with either of the others, and this in spite of the continental area which drains into the Atlantic being far larger than those which feed the Pacific and Indian Oceans. He attributes the higher salinity of the Atlantic to the large amount of water-vapour which is carried on to the continents, which are of comparatively low altitude where they front this ocean. A map of the salinity of the oceans, the drainage areas supplying them, and the altitudes of coast margins is included.

IN *The Geographical Journal* for January, Sir David Gill, F.R.S., describes the 4-metre and 24-metre comparators which have been constructed for the Government of India by the Cambridge Instrument Company under his supervision. The former is for comparing all standards of length up to 4 metres, and enables the determination of their absolute coefficients of expansion by heat; the latter is designed for comparing the lengths of 24-metre invar wires or tapes with a standard 4-metre bar. Unfortunately, only a summary is given of the description of these important pieces of apparatus, and no plans are included.

At the same meeting Mr. J. A. A. Baugh discussed the preparation of invar tapes, and quoted the results of experiments made to determine their variation due to ageing, rolling and unrolling, and tension. The experiments were very instructive, though the number quoted was small. He referred to the difficulty of determining the true temperature of a tape suspended in air, and advocated its determination by means of its electrical resistance. Mr. B. F. E. Keeling directed attention to this difficulty in 1910, and showed that there might be as much as 2° C. between the tape and the surrounding air.

Referring to the letter on concentric joints in ice by Mr. H. J. F. Gourley in Nature of January 25, Julia R. Grugell, of Burleigh Stroud, Gloucestershire, sends some observations on the same phenomenon. The roadside pool studied was 6 feet long, 4 feet broad, and 1 foot deep in the middle and about 3 inches at the side. The rings seen only followed the line of the edge on one side, and halfway round the ends, projecting stones apparently interfering with their formation on the other side. A piece of ice, 16 inches square, cut out and examined showed the bulb formation. The ice was 2 inches thick at the edge, and the first bulb was 3½ inches from the edge and projected 2 inches, being followed by four others of varying shapes. Along the line of the rings the bulbs appeared to be continuous, except the second, which was saucer-shaped in appearance. Looking at the surface of the pool, which was of very smooth ice, the rings were seen alternately clear and opaque, and inspection of the under-surface of the piece removed showed the bulbs were clear through to the surface. The opaque effect seemed to be due to ice crystals on the under-surface of the ice. The ice was the result of several nights' frost, with no thaw by day.

In connection with the exceptionally warm weather of last summer in Europe and the United States, an article by Mr. R. C. Mossman in *Symons's Meteorological Magazine* for January, on the "Abnormal Weather in South America during 1911," is of considerable interest. For the region north of lat. 40° S. in Argentina and part of Brazil the following mean temperatures below the normal (1898–1907) are given for the four months June-September:—mean max. 2·5° F., mean min. 3·0°, mean temperature 2·7°. From a map showing the departures of the mean temperature for the three months June-August in Argentina it is seen that the greatest depression, viz. 5°, was in a small area in the province of Corrientes. South of latitude 35°, except for a small patch in Buenos Aires, the depression did not exceed 2°, and south of 41° the temperature was above the average, reaching an excess of 3·5° near the Atlantic entrance to the Straits of Magellan. The author observes that there is little doubt that during the year in question a marked displacement of the "centres of action" of both hemispheres took place. In South America the meteorology of the whole year presented a sequence of abnormal features, among the most prominent being excessive rainfall at Rio de Janeiro in March, 1911, and extreme drought in Buenos Aires in the same month.

A course of lectures delivered before the students of the Johns Hopkins University by Dr. Charles Edward Brooks, on "Tables of Mortality and the Theory of Probability," is published in abstract in the Johns Hopkins University Circular, No. 10. The abstract of the six lectures only occupies forty-two pages, and is accompanied by a reprint of the "American Experience" table of mortality. It should enable any student possessing an elementary knowledge of algebra and the mere notation of the calculus to solve ordinary problems on life insurance with a very small amount of preliminary study. It shows that the study of probabilities and statistics is not nearly so difficult as is commonly supposed. It is highly desirable that schoolboys should learn the elementary notions of probability soon after they have learnt to multiply vulgar fractions, and that the elements of statistical mathematics should be taught in schools and colleges in place of much of the present useless algebraical drill.

A report on graduate work in mathematics in the United States universities and colleges is published in the Bulletin of the American Mathematical Society for December, 1911, and forms part of the report of the International Commission on the Teaching of Mathematics. It would appear that forty years ago practically no facilities existed for the study of higher mathematics, the school established at Harvard under Benjamin Peirce being one of a few noteworthy exceptions. At present a much more satisfactory state of affairs has been reached, many institutions, both large and small, possessing well-attended schools of higher study frequented by both graduate and undergraduate students. The report deals, further, on the advantages and disadvantages of study abroad, the former including the acquisition of foreign languages. In regard to the training of teachers in higher mathematics, the report reveals a very different state of affairs from that now prevailing in England, namely, an excess of demand over supply. This, in the opinion of the committee, is likely to have a disastrous effect in encouraging graduates of mediocre ability to undertake some work that they can call "research" in order to qualify as college instructors.

With the aid of the Rumford Fund, Mr. P. W. Bridgman, of the Jefferson Physical Laboratory of Harvard University, has continued his experiments on the properties of substances under pressures up to 12,000 atmospheres. His most recent work relates to mercury, and the results are published as Memoir 12 of vol. xlvii. of the Proceedings of the American Academy. He uses a steel piezometer, through the bottom of which a minute hole is made. The piezometer is filled with mercury, and is subjected to pressure in a cylinder of water. As the pressure is applied, water is forced into the piezometer. When the pressure is withdrawn mercury flows out, and the amount which remains in the instrument allows the compression to be determined if those of the water and the steel are known. That of steel was determined independently by the change of length of a rod under pressure. That of water was measured by inverting the piezometer, filling it with water, and subjecting it to pressure in a cylinder of mercury. As the experiments were carried out at temperatures from −39° C. to +22° C., they allow the isothermals for solid and liquid mercury between these limits to be drawn on a pressure-volume diagram.

Vol. vi. of the Journal of the Institute of Metals contains the May lecture of 1911, delivered by Dr. G. T. Beilby. The title, "The Hard and Soft States in Metals," gives a very inadequate idea of the importance of the conclusions which the author has reached by his investigations on metals and other substances. The central fact appears to be that the molecules of any pure substance may be assembled in two different ways, each of which imparts to the substance distinct physical properties. In the first form the substance is crystalline, stable under heat treatment, but yields readily to mechanical forces. In the second the substance is amorphous, becomes crystalline under heat treatment, but is much more stable under mechanical forces than the former. Even gentle polishing of a surface is sufficient to break down the first or crystalline form near the surface, and the material flows, ultimately solidifying in the second or amorphous state. Wire-drawing or other mechanical treatment produces the same effect, and the author shows how most of the properties of materials used in construction are due to the presence in them of molecules in the two states of aggregation.

A PAPER by Dr. E. Weiss, of the University of Prague, which appears in the July (1911) number of the *Sitzungsberichte* of the Academy of Vienna, offers a satisfactory explanation of the deviations of the values for the elementary quantity or "atom" of electricity found recently by Dr. Ehrenhaft and by Dr. Przibram from the value found by Prof. Millikan. Like the other observers who have worked in this field, Dr. Weiss uses the speed of motion of electrically charged minute particles of matter either under gravity alone or under gravity and an electric field combined. His particles were of silver of diameters about 10^{-5} cm., obtained by the aid of an electric arc. His arrangement allowed the same particle to be observed during twenty or more falls, and the speeds found differed amongst themselves by 50 per cent. in the case of the smallest particles. When Stokes's law, either in its original form or with Cunningham's correction, is applied to the observations, the values of the electric charges in many cases come less than the atomic charge. Weiss shows that this is due to the particles executing Brownian movements, and when he applies Einstein's theory of these motions to the observations, he finds they give values of the atomic charge between 4 and 5×10^{-10} electrostatic units, in agreement with the number generally accepted.

THE isolation by Willstätter and Esch, recorded in the current number (vol. lxxvi., Heft 2 and 3) of the *Zeitschrift für physiologische Chemie*, of the yellow pigment of yolk of egg in a crystalline state, and the identification of its chemical nature as closely related to the xanthophyll of green leaves, is an important contribution to knowledge. Willstätter's earlier work enabled him to classify the chemically indifferent colouring matters of animal and plant pigments into two classes, the hydrocarbons, $C_{40}H_{56}$, of the carrotene group, soluble in light petroleum, and the related oxygen compounds, $C_{40}H_{56}O_2$, of the xanthophyll series, soluble in alcohol. Nearly two years ago he was able to show that lycopene, the red pigment of tomatoes, was a member of the carrotene group. As the result of the extraction of the yolks of 6000 hens' eggs, about 4 grams of a crude pigment remained. This has been purified by crystallisation from a variety of solvents, from which the pigment, which it is proposed to name luteine, separates in characteristic coloured forms. Analysis shows it to be an isomeride of xanthophyll, and this is confirmed by the study of the absorption spectrum and other properties.

AT a meeting of the Institute of Chemistry, held at University College, London, on January 26, a lecture was delivered by Mr. C. F. Cross on "Cellulose." He pointed out that cellulose, as a basis of manufacture, takes an important position. Primary manufactured products at factory cost represent values approaching 200,000,000*l.* per annum for the United Kingdom. Cellulose derivatives form the basis of smokeless powders, an indispensable auxiliary to photographic art, and the raw material of "celluloid." Taking cellulose as a typical colloid, and enlarging our view to include industries based upon colloids, their preponderance is evident. Industry is chiefly busy in transforming colloidal substances of entirely natural origin. Normal cellulose is still rather a laboratory term and product. The so-called "pure" cellulose in the form of chemical filter papers represented about 90 to 95 per cent. only of "normal" purity. The supposed identity of "rag cellulose" with "normal cellulose" is an illusion. Mr. Cross suggested that the type of combination of lignone with cellulose to form the complex "lignocellulose" may in time modify our views of chemical combination.

WE learn from *The Engineer* for February 2 that in the middle of last month there was put to work a single-deck petrol tramcar on the short tram-line connecting Morecambe and Heysham. This car is the first of three ordered for this service, is capable of carrying thirty-seven passengers, and is driven by a 55 horse-power four-cylinder petrol motor. Now that the petrol tramcar is an accomplished fact, it will be interesting to watch the effect on the fortunes of electric tramway systems. There appears to be no reason why petrol tramcars should not answer their purpose as well as electric cars, and it is evident that success will render them formidable opponents. It is too early as yet to attempt any comparative estimate of costs of running or of upkeep, but it must be remembered that the electric system calls for heavy expenditure in overhead or underground equipment, and also for a generating station in those cases where the tramway authority cannot purchase its electricity.

BULLETIN No. 49 of the University of Illinois contains an account of tests on nickel-steel riveted joints carried out by Messrs. A. N. Talbot and H. F. Moore at the university engineering experiment station. A total of ninety nickel-steel and fifty-four chrome-nickel-steel joints were tested in tension, sixteen nickel-steel and sixteen chrome-nickel-steel joints were tested in tension, compression, and alternate tension and compression. Stretch, slip, and set of riveted joints were observed, as well as the bending of the rivets. There was a noticeable slip of joint generally at loads within ordinary working shearing stress of rivet. The movement of the joint increased fairly regularly to a load averaging about 35,000 lb. per square inch of rivet shear for the nickel-steel joints, when a marked increase of movement was found. This increase was closely coincident with a marked set of the joint and with a marked bending of the rivet. All the riveted joints failed by shear of the rivets, at ultimate shearing stresses, which ran fairly uniform in both the nickel-steel and the chrome-nickel-steel series for all the types of joint tested. In the alternated load tests, the most striking feature was the relatively large slip which took place at comparatively low loads. The amount of this slip was especially large when a joint had been subjected to a single load considerably beyond the ordinary load.

PROF. A. M. WORTHINGTON, C.B., F.R.S., contributes to the February number of *Pearson's Magazine* a well-illustrated article upon his photographic analysis of the splash and jet produced by dropping a rough marble into water from different heights. The same number contains an account of the life-story, with illustrations, of the nightjar, by Mr. E. C. Andrews.

THE annual volume for 1911 of the "Bulletin of Miscellaneous Information" of the Royal Botanic Gardens, Kew, is now available. The volume is published by H.M. Stationery Office at the price of 4*s.* 6*d.*, and may be purchased from Messrs. Wyman and Sons, Ltd., of Fetter Lane, London, E.C. Several of the papers in the ten separate numbers included in the volume have already been noticed from time to time in these columns.